



Laramie Energy, LLC

**Mesa County, CO
Hayward 0993 25-09 Pad
Hayward 0993-25-14E**

A-4

Plan: Design #2

QES Well Planning Report

14 May, 2019





Well Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Hayward 0993-25-14E
Company:	Laramie Energy, LLC	TVD Reference:	RKB @ 8037.0usft (H&P #522)
Project:	Mesa County, CO	MD Reference:	RKB @ 8037.0usft (H&P #522)
Site:	Hayward 0993 25-09 Pad	North Reference:	True
Well:	Hayward 0993-25-14E	Survey Calculation Method:	Minimum Curvature
Wellbore:	A-4		
Design:	Design #2		

Project	Mesa County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		

Site		Hayward 0993 25-09 Pad			
Site Position:		Northing:	1,519,030.59 usft	Latitude:	39.237495
From:	Lat/Long	Easting:	2,373,084.06 usft	Longitude:	-107.713617
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-1.40 °

Well	Hayward 0993-25-14E					
Well Position	+N/-S	2,664.2 usft	Northing:	1,521,709.38 usft	Latitude:	39.244810
	+E/-W	-629.9 usft	Easting:	2,372,519.30 usft	Longitude:	-107.715841
Position Uncertainty		0.0 usft	Wellhead Elevation:		Ground Level:	8,007.0 usft

Wellbore	A-4
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	5/9/2019	9.08	65.20	51,203.10000000

Design	Design #2
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Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	144.23

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
450.0	0.00	0.00	450.0	0.0	0.0	0.00	0.00	0.00	0.00	
783.3	10.00	185.00	781.6	-28.9	-2.5	3.00	3.00	0.00	185.00	
1,144.9	20.40	172.53	1,130.2	-123.0	2.9	3.00	2.88	-3.45	-23.58	
6,139.2	20.40	172.53	5,811.1	-1,849.4	229.4	0.00	0.00	0.00	0.00	
6,819.4	0.00	0.00	6,477.0	-1,968.2	245.0	3.00	-3.00	0.00	180.00	
8,769.4	0.00	0.00	8,427.0	-1,968.2	245.0	0.00	0.00	0.00	0.00	PBHL - Hayward 09



Well Planning Report



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Project:	Mesa County, CO	MD Reference:	RKB @ 8037.0usft (H&P #522)
Site:	Hayward 0993 25-09 Pad	North Reference:	True
Well:	Hayward 0993-25-14E	Survey Calculation Method:	Minimum Curvature
Wellbore:	A-4		
Design:	Design #2		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	0.00
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00
KOP/ (Build 3°/100')									
450.0	0.00	0.00	450.0	0.0	0.0	0.0	0.00	0.00	0.00
500.0	1.50	185.00	500.0	-0.7	-0.1	0.5	3.00	3.00	0.00
600.0	4.50	185.00	599.8	-5.9	-0.5	4.5	3.00	3.00	0.00
700.0	7.50	185.00	699.3	-16.3	-1.4	12.4	3.00	3.00	0.00
EOB @ 10.00° Inc. / 185.00° Azm / Build 3° / 100'									
783.3	10.00	185.00	781.6	-28.9	-2.5	22.0	3.00	3.00	0.00
800.0	10.46	183.90	798.0	-31.9	-2.8	24.2	3.00	2.76	-6.61
900.0	13.28	178.90	895.9	-52.4	-3.2	40.7	3.00	2.82	-5.00
1,000.0	16.17	175.64	992.6	-77.8	-1.9	62.0	3.00	2.88	-3.26
1,100.0	19.08	173.35	1,087.9	-107.9	1.1	88.2	3.00	2.92	-2.29
EOB @ 20.40° Inc. / 172.53° Azm									
1,144.9	20.40	172.53	1,130.2	-123.0	2.9	101.5	3.00	2.94	-1.83
1,200.0	20.40	172.53	1,181.8	-142.0	5.4	118.4	0.00	0.00	0.00
1,300.0	20.40	172.53	1,275.5	-176.6	10.0	149.1	0.00	0.00	0.00
1,400.0	20.40	172.53	1,369.3	-211.1	14.5	179.8	0.00	0.00	0.00
1,500.0	20.40	172.53	1,463.0	-245.7	19.0	210.5	0.00	0.00	0.00
8 5/8"									
1,530.0	20.40	172.53	1,491.1	-256.1	20.4	219.7	0.00	0.00	0.00
1,600.0	20.40	172.53	1,556.7	-280.3	23.6	241.2	0.00	0.00	0.00
1,700.0	20.40	172.53	1,650.4	-314.8	28.1	271.9	0.00	0.00	0.00
1,800.0	20.40	172.53	1,744.2	-349.4	32.7	302.6	0.00	0.00	0.00
1,900.0	20.40	172.53	1,837.9	-384.0	37.2	333.3	0.00	0.00	0.00
2,000.0	20.40	172.53	1,931.6	-418.5	41.7	364.0	0.00	0.00	0.00
2,100.0	20.40	172.53	2,025.3	-453.1	46.3	394.7	0.00	0.00	0.00
2,200.0	20.40	172.53	2,119.1	-487.7	50.8	425.4	0.00	0.00	0.00
2,300.0	20.40	172.53	2,212.8	-522.2	55.3	456.1	0.00	0.00	0.00
2,400.0	20.40	172.53	2,306.5	-556.8	59.9	486.8	0.00	0.00	0.00
2,500.0	20.40	172.53	2,400.2	-591.4	64.4	517.5	0.00	0.00	0.00
2,600.0	20.40	172.53	2,494.0	-625.9	68.9	548.2	0.00	0.00	0.00
2,700.0	20.40	172.53	2,587.7	-660.5	73.5	578.9	0.00	0.00	0.00
2,800.0	20.40	172.53	2,681.4	-695.1	78.0	609.6	0.00	0.00	0.00
2,900.0	20.40	172.53	2,775.1	-729.7	82.5	640.2	0.00	0.00	0.00
3,000.0	20.40	172.53	2,868.9	-764.2	87.1	670.9	0.00	0.00	0.00
3,100.0	20.40	172.53	2,962.6	-798.8	91.6	701.6	0.00	0.00	0.00
3,200.0	20.40	172.53	3,056.3	-833.4	96.1	732.3	0.00	0.00	0.00
3,300.0	20.40	172.53	3,150.0	-867.9	100.7	763.0	0.00	0.00	0.00
G' Sand									
3,328.8	20.40	172.53	3,177.0	-877.9	102.0	771.9	0.00	0.00	0.00
3,400.0	20.40	172.53	3,243.8	-902.5	105.2	793.7	0.00	0.00	0.00
3,500.0	20.40	172.53	3,337.5	-937.1	109.7	824.4	0.00	0.00	0.00
3,600.0	20.40	172.53	3,431.2	-971.6	114.3	855.1	0.00	0.00	0.00
3,700.0	20.40	172.53	3,524.9	-1,006.2	118.8	885.8	0.00	0.00	0.00
3,800.0	20.40	172.53	3,618.7	-1,040.8	123.3	916.5	0.00	0.00	0.00
3,900.0	20.40	172.53	3,712.4	-1,075.3	127.9	947.2	0.00	0.00	0.00
4,000.0	20.40	172.53	3,806.1	-1,109.9	132.4	977.9	0.00	0.00	0.00
4,100.0	20.40	172.53	3,899.8	-1,144.5	136.9	1,008.6	0.00	0.00	0.00
4,200.0	20.40	172.53	3,993.6	-1,179.0	141.5	1,039.3	0.00	0.00	0.00
4,300.0	20.40	172.53	4,087.3	-1,213.6	146.0	1,070.0	0.00	0.00	0.00



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Well:	Hayward 0993-25-14E	Survey Calculation Method:	Minimum Curvature
Wellbore:	A-4		
Design:	Design #2		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,400.0	20.40	172.53	4,181.0	-1,248.2	150.5	1,100.7	0.00	0.00	0.00
4,500.0	20.40	172.53	4,274.8	-1,282.7	155.1	1,131.4	0.00	0.00	0.00
4,600.0	20.40	172.53	4,368.5	-1,317.3	159.6	1,162.1	0.00	0.00	0.00
4,700.0	20.40	172.53	4,462.2	-1,351.9	164.1	1,192.8	0.00	0.00	0.00
4,800.0	20.40	172.53	4,555.9	-1,386.4	168.7	1,223.5	0.00	0.00	0.00
4,900.0	20.40	172.53	4,649.7	-1,421.0	173.2	1,254.2	0.00	0.00	0.00
5,000.0	20.40	172.53	4,743.4	-1,455.6	177.8	1,284.9	0.00	0.00	0.00
5,100.0	20.40	172.53	4,837.1	-1,490.1	182.3	1,315.6	0.00	0.00	0.00
5,200.0	20.40	172.53	4,930.8	-1,524.7	186.8	1,346.3	0.00	0.00	0.00
5,300.0	20.40	172.53	5,024.6	-1,559.3	191.4	1,377.0	0.00	0.00	0.00
5,400.0	20.40	172.53	5,118.3	-1,593.8	195.9	1,407.7	0.00	0.00	0.00
Ohio Creek									
5,409.3	20.40	172.53	5,127.0	-1,597.1	196.3	1,410.5	0.00	0.00	0.00
5,500.0	20.40	172.53	5,212.0	-1,628.4	200.4	1,438.4	0.00	0.00	0.00
5,600.0	20.40	172.53	5,305.7	-1,663.0	205.0	1,469.1	0.00	0.00	0.00
5,700.0	20.40	172.53	5,399.5	-1,697.6	209.5	1,499.8	0.00	0.00	0.00
Williams Fork									
5,782.7	20.40	172.53	5,477.0	-1,726.2	213.2	1,525.2	0.00	0.00	0.00
5,800.0	20.40	172.53	5,493.2	-1,732.1	214.0	1,530.5	0.00	0.00	0.00
5,900.0	20.40	172.53	5,586.9	-1,766.7	218.6	1,561.2	0.00	0.00	0.00
6,000.0	20.40	172.53	5,680.6	-1,801.3	223.1	1,591.9	0.00	0.00	0.00
6,100.0	20.40	172.53	5,774.4	-1,835.8	227.6	1,622.6	0.00	0.00	0.00
Drop 3° / 100'									
6,139.2	20.40	172.53	5,811.1	-1,849.4	229.4	1,634.6	0.00	0.00	0.00
6,200.0	18.58	172.53	5,868.4	-1,869.5	232.0	1,652.5	3.00	-3.00	0.00
6,300.0	15.58	172.53	5,964.0	-1,898.6	235.9	1,678.3	3.00	-3.00	0.00
6,400.0	12.58	172.53	6,061.0	-1,922.7	239.0	1,699.7	3.00	-3.00	0.00
6,500.0	9.58	172.53	6,159.1	-1,941.8	241.5	1,716.7	3.00	-3.00	0.00
6,600.0	6.58	172.53	6,258.1	-1,955.7	243.4	1,729.0	3.00	-3.00	0.00
6,700.0	3.58	172.53	6,357.7	-1,964.5	244.5	1,736.8	3.00	-3.00	0.00
6,800.0	0.58	172.53	6,457.6	-1,968.1	245.0	1,740.0	3.00	-3.00	0.00
EOD @ Vertical - TOG									
6,819.4	0.00	0.00	6,477.0	-1,968.2	245.0	1,740.1	3.00	-3.00	0.00
6,900.0	0.00	0.00	6,557.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,000.0	0.00	0.00	6,657.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,100.0	0.00	0.00	6,757.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,200.0	0.00	0.00	6,857.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,300.0	0.00	0.00	6,957.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,400.0	0.00	0.00	7,057.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,500.0	0.00	0.00	7,157.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,600.0	0.00	0.00	7,257.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,700.0	0.00	0.00	7,357.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,800.0	0.00	0.00	7,457.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
7,900.0	0.00	0.00	7,557.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,000.0	0.00	0.00	7,657.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,100.0	0.00	0.00	7,757.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
Cameo									
8,169.4	0.00	0.00	7,827.0	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,200.0	0.00	0.00	7,857.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,300.0	0.00	0.00	7,957.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,400.0	0.00	0.00	8,057.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
8,500.0	0.00	0.00	8,157.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00
Base Cameo Coal									



Well Planning Report



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Wellbore:	A-4		
Design:	Design #2		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
8,549.4	0.00	0.00	8,207.0	-1,968.2	245.0	1,740.1	0.00	0.00	0.00	
Rollins										
8,569.4	0.00	0.00	8,227.0	-1,968.2	245.0	1,740.1	0.00	0.00	0.00	
8,600.0	0.00	0.00	8,257.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00	
8,700.0	0.00	0.00	8,357.6	-1,968.2	245.0	1,740.1	0.00	0.00	0.00	
TD @ 8769.4' MD / 8427.0' TVD										
8,769.4	0.00	0.00	8,427.0	-1,968.2	245.0	1,740.1	0.00	0.00	0.00	

Design Targets										
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude	
- hit/miss target										
- Shape										
PBHL - Hayward 0993	0.00	0.00	8,427.0	-1,968.2	245.0	1,519,735.78	2,372,716.22	39.239406	-107.714976	
- plan hits target center										
- Circle (radius 65.0)										

Casing Points						
Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")		
1,530.0	1,491.1	8 5/8"	8-5/8	11		

Formations						
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)	
3,328.8	3,177.0	G' Sand				
5,409.3	5,127.0	Ohio Creek				
5,782.7	5,477.0	Williams Fork				
6,819.4	6,477.0	TOG				
8,169.4	7,827.0	Cameo				
8,549.4	8,207.0	Base Cameo Coal				
8,569.4	8,227.0	Rollins				

Plan Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment	
450.0	450.0	0.0	0.0	KOP/ (Build 3°/100')	
783.3	781.6	-28.9	-2.5	EOB @ 10.00° Inc. / 185.00° Azm / Build 3° / 100'	
1,144.9	1,130.2	-123.0	2.9	EOB @ 20.40° Inc. / 172.53° Azm	
6,139.2	5,811.1	-1,849.4	229.4	Drop 3° / 100'	
6,819.4	6,477.0	-1,968.2	245.0	EOD @ Vertical	
8,769.4	8,427.0	-1,968.2	245.0	TD @ 8769.4' MD / 8427.0' TVD	